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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,872	06/24/2003	Won-Bong Choi	030681-521	1325

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BUCHANAN, INGERSOLL & ROONEY PC  
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EXAMINER
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LEE, CYNTHIA K

ART UNIT	PAPER NUMBER
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1795

NOTIFICATION DATE	DELIVERY MODE
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11/17/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/601,872	<b>Applicant(s)</b> CHOI ET AL.	
	<b>Examiner</b> CYNTHIA LEE	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4, 13-16 and 31-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4, 13-16, 31 and 32 is/are allowed.
- 6) ☒ Claim(s) 33-45 is/are rejected.
- 7) ☒ Claim(s) 34 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/25/2008 has been entered.

***Response to Arguments***

This Office Action is responsive to the amendment filed on 9/25/2008. Claims 1-4, 13-16, 31-45 are pending. Claims 43-45 have been added.

Claims 1-4, 13-16, 31, and 32 are allowed.

Claims 33-45 are non-finally rejected for reasons of record.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 33 -45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation "without deviation of the main axis region" is unclear. It is unclear as to in what manner the does not occur. Clarification is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 33-35, 37-39, 41, are rejected under 35 U.S.C. 102(e) as being anticipated by Li (US 7157068).

Li discloses branched carbon nanotubes, particularly non-aligned CNTs, with different tubule morphologies that include, for example, (1) cylindrical hollow single-walled and multi-walled nanotube structures (SWNT and MWNT respectively), (2) conically overlapping or "bamboo-like" tubule structures, wherein successive end-capped graphene layers comprising individual tubules are staggered in a telescoping, stacked arrangement; and (3) branched or "Y-shaped" tubule structures with symmetric, straight-armed tubules forming fixed angles between individual arms. Branched CNTs can include, for example, "Y-shaped" CNTs and "kinked" CNTs. The methods of the present invention allow the control of morphology and structural characteristics of individual CNT tubules during their formation, thereby enabling the synthesis of CNTs with specific morphology, structure, mechanical and chemical properties. Thus CNTs having either a cylindrical, hollow tubule structure with concentric graphene layers, or a conical "bamboo-like" structure wherein successive end-capped graphene layers are

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staggered in a telescoping, stacked arrangement can be produced by the methods of the present invention. These configurations are schematically illustrated in FIG. 1 (3:5-35). Also refer to 8:45-63.

Li does not expressly disclose the internal and external walls of the carbon nanotubes are uniformly doped with catalyst particles. The Instant Specification states on pg 6, lines 3-4 that "While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes." The Examiner notes that Li's internal and external walls of the carbon nanotubes are also doped with catalyst particles. Absent specific degree of "uniform," the Examiner notes that mixing of catalyst particles in Li's Example 2 meets the limitation "uniform" (applicant's claim 35,).

Regarding claims 33 and 37, in light of the 112, 2<sup>nd</sup> issue, it is noted that two or more branches of Li emanate from the main axis portion. See Fig. 5c.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 36 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) as applied to claims 35 and 39.

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Li does not expressly disclose the internal and external walls of the carbon nanotubes are uniformly doped with catalyst particles. The Instant Specification states on pg 6, lines 3-4 that "While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes." The Examiner notes that Li's internal and external walls of the carbon nanotubes are also doped with catalyst particles. Absent specific degree of "uniform," the Examiner notes that mixing of catalyst particles in Li's Example 2 meets the limitation "uniform".

Li does not expressly disclose that the catalyst particles are dispersed to a degree of 0.3-5 mg/cm<sup>2</sup>. Li discloses that catalyst nanoparticles are impregnated into a mesoporous silica, which is ground into micro-particles to increase reactive surface area of the catalyst substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the size of the catalyst particles for the benefit of increasing or decreasing the surface area of the effective catalytic sites.

Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) as applied to claim 37, in view of Coll (US 6596187).

Li discloses catalyst of iron, cobalt, nickel, or alloys and combinations thereof (10:5-20). Li does not disclose a catalyst that acts as both a catalyst for carbon nanotube growth and as a fuel cell catalyst. Coll teaches platinum as catalyst for carbon nanotube growth (2:60). It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the catalyst of Li with Coll's platinum catalyst because it has been held by the court that the selection of a known

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material based on its suitability for its intended use is *prima facie* obvious. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. The Examiner notes that platinum is a fuel cell catalyst.

### ***Response to Arguments***

Applicant's arguments with regards to claims 33-45 filed 9/25/2008 have been fully considered but they are not persuasive. As stated above, it is noted that two or more branches of Li emanate from the main axis portion. See Fig. 5c.

### ***Allowable Subject Matter***

Claims 1-4, 13-16, 31, and 32 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The closest prior art is Li (US 7157068). Li does not disclose nor suggest “two or more branches branch out symmetrically around the main axis from the first portions to form branched carbon nanotubes” as recited in claim 1. Li discloses a “Y” shaped carbon nanotubes, and thus the branches emanate from the terminal portion and not the main axis.

### ***Conclusion***

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Cynthia Lee/  
Examiner, Art Unit 1795

/PATRICK RYAN/  
Supervisory Patent Examiner, Art  
Unit 1795